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For: ADDITIVES FOR PAINTS AND INKS

VERIFICATION OF TRANSLATION

OF

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Assistant Commissioner for Patents,
Washington, DC 20231

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2. I am thoroughly conversant with both the Japanese and English languages,

3. The attached is a true English language translation of the certified copy of Japanese Patent Application No. 2000-255720 filed August 25, 2000.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Tokyo, this 22nd day of April, 2003

Signed By: Akiko Kojima

Name: Akiko KOJIMA

(TRANSLATION)

JAPAN PATENT OFFICE

This is to certify that the annexed is a true copy of the following application as filed with this Office.

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[Title of the Invention] Defoamer and Flow-and-Leveling Agent for Clear Paints

[Claims]

[Claim 1]

A defoamer and flow-and-leveling agent for paints or inks, which is characterized by comprising a copolymer of 2-50% by weight of a reactive monomer having isocyanate group or an isocyanate-derived group with 98-50% by weight of other monomer or polymer which is reactable with said reactive monomer.

[Detailed Description of the Invention]

[0001]

[Technical field to which the invention belongs]

This invention relates to defoamers and flow-and-leveling agents for paints and inks which have a property to prevent a phenomenon of white blooming or turbidity of dry painted films (which may hereafter be collectively referred to as anti-whitening property) caused after anti-warm-water test for clear paints which transparency is the most important requirement, and furthermore, provide defoaming and anti-popping property or flow-and-leveling property.

[0002]

[Prior art]

Paints are generally blended with defoamers for removing foams which are entrained during paint application, or with flow-and-leveling agents (leveling agents) for improving wettability of painting objects with paints and assisting level painting. Whereas, when the defoamers and flow-and-leveling agents (which may hereafter be collectively referred to as surface control agents) are blended with paint, they remain in cured clear paint film in the form of particles. Some of the new curing type thermosetting or baking clear systems in which no melamine resin is used as the curing agent, which have recently appeared in the market as a countermeasure to acid precipitation, exhibit the whitening phenomenon of dry painted films after immersion of painted films in warm water. Examples of such baking clear systems include glycidyl group-containing acrylic resin/acid anhydride-curing type clear paint.

[0003]

[The problem to be solved by the invention]

Generally a defoaming and anti-popping agent is blended in paint before the latter's application to an object, to prevent such phenomena that the foams which were entrained during the paint application remain on the painted surface to degrade appearance of the painted film or that pinholes caused by such foams impair protection performance of the painted object. Also for preventing uneven painting or ruptures in painted film caused by foreign matters present on the painted object, as well as for assisting level and beautiful finish of the painted surface, flow-and-leveling agent is blended in paint.

[0004]

Whereas, when conventional surface control agents are blended in new curing type paints using no melamine resin as curing agent, which recently appeared in the market as a countermeasure to acid precipitation on automobiles, the following phenomena are occasionally observed.

[0005]

In cured films of such new curing type paints, those blended surface control agents remain as fine particles. In consequence, when water penetrates into the interfaces between the surface control agent particles and the paint film, bubbles are formed in the surface control agent particles after the water is removed from the paint film, to impart the paint film white, turbid appearance. This whitening phenomenon is apt to impair appearance of the paints finish. On the other hand, reduction in the blended amount of surface control agents to avoid deterioration in clarity of the paint film often results in unsatisfactory exhibition of the primary functions of the surface control agents.

[0006]

Accordingly, therefore, the object of the present invention is to provide surface control agents which do not cause a phenomenon of turbidity for anti-whitening when they are blended in clear paints which transparency is the most important requirement.

[0007]

[Means to solve the problem]

We have engaged in extensive studies to discover that copolymers

obtained by reacting reactive monomers used in conventional surface control agents for paints with reactive monomers having isocyanate groups or those having groups derived from isocyanate groups can prevent anti-whitening phenomenon without impairing the effects of the original surface control agents when they are blended in clear paints.

[0008]

Thus, according to the present invention, a defoaming and anti-popping agent or flow-and-leveling agent for paints and inks is provided, which is characterized by comprising a copolymer obtained through copolymerization of 2-50% by weight of a reactive monomer having isocyanate group or an isocyanate-derived group with 98-50% by weight of other monomer or polymer which is reactable with said reactive monomer.

[0009]

When the ratio of said monomer having isocyanate group or an isocyanate-derived group in the copolymer according to the invention is less than 2% by weight, the intended effect for preventing anti-whitening phenomenon, when they are blended in clear paints, cannot be satisfactorily accomplished. On the other hand, when the ratio exceeds 50% by weight, the effects as a surface control agent are not fully exhibited or paint film properties are adversely affected.

[0010]

Examples of reactive monomers having isocyanate groups include 2-isocyanatoethyl methacrylate, 2-isocyanatoethyl acrylate and 3-isopropenyl-α,α-dimethylbenzyl isocyanate.

[0011]

Examples of reactive monomers having isocyanate-derived groups include 2-(0-[1'-methylpropylideneamino]carboxyamino)ethyl methacrylate and 2-(0-[1'-methylpropylideneamino]carboxyamino)ethyl acrylate.

[0012]

As other monomers or polymers reactable with reactive monomers having isocyanate groups or isocyanate-derived groups, for example, alkyl esters of acrylic acid such as ethyl acrylate, butyl acrylate, 2-ethylhexyl acrylate and lauryl acrylate; alkyl esters of methacrylic acid such as ethyl methacrylate,

butyl methacrylate, 2-ethylhexyl methacrylate, lauryl methacrylate, hexadecyl methacrylate and octadecyl methacrylate; alkyl vinyl ethers such as ethyl vinyl ether, propyl vinyl ether, butyl vinyl ether, 2-ethylhexyl vinyl ether, lauryl vinyl ether and octadecyl vinyl ether; reactive silicone having methacryloyloxy groups (Silaplane ™FM-0711 marketed by Chisso Corporation, AK-5 and AK-30 marketed by Toagosei Co., Ltd.); reactive acrylic polymers which are normally referred to as macromonomers (Diamac Series marketed by Mitsubishi Chemical Corporation and A-Series marketed by Toagosei Co., Ltd.); and polymers having reactive groups such as butadiene polymers can be named. Besides these, there are many kinds of monomers and polymers which are useful as starting materials of surface control agents, all of which are utilizable so long as they are copolymerizable with reactive monomers having isocyanate groups or isocyanate-derived groups.

[0013]

Synthesis of a copolymer from above reactive monomers can be performed following radical polymerization process using peroxide or azo compound, cationic polymerization process using acid catalyst, or anionic polymerization process using alkali metal catalyst. The present invention concerns development of utility of the copolymers, and is in no way limited by their method of synthesis.

[0014]

The paints which are suited to the present invention are clear paints for which transparency of the finish is of predominant importance, and are usable with effectiveness for clear top coat paint for automobiles in which anti-whitening is a significant factor, and precoat metal (PCM) paint.

[0015]

The surface control agents for paints according to the present invention can be added to paints either during the process of preparing, or after the preparation, of the paints.

[0016]

The use rate of a surface control agent for paints according to the invention is dependent on various factors such as nature of the paint, conditions of use of the paint, painting conditions of the paint and the like and hence no

certain limits can be provided. Whereas, it is generally used within a range of 0.001 to 5.0%, preferably 0.01 to 2.0%, as converted to solid, based on the weight of the paint compositions. Furthermore, it may be blended in a greater amount than that of a conventional surface control agent for paint, because the former is less tended to cause anti-whitening phenomenon.

[0017]

[Effects of the invention]

The surface control agent for paint or ink according to the present invention is characterized by containing isocyanate groups or isocyanate-derived groups in the polymer compositions, and it prevents the phenomenon of paint film appearing white and turbid even in the presence of particles of the surface control agent in the cured paint film.

[0018]

[Examples]

Hereinafter the invention is explained in further details, referring to Examples in which parts and percentages are by weight.

Production Example 1 of a defoaming agent

A 1000 ml-reaction vessel equipped with a stirrer, reflux condenser, dropping funnel, thermometer and gaseous nitrogen inlet port was charged with 100 parts of xylene, which was heated to 100°C under introduction of gaseous nitrogen. Thereafter the following solution (a-1) was dropped into said xylene at a constant rate through the dropping funnel, consuming 90 minutes.

Solution (a-1)

Octadecyl methacrylate	285 parts
2-Isocyanatoethyl methacrylate	15 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	5 parts

An hour after completion of the dropwise addition of the solution (a-1), 1.5 parts of the t-butylperoxy-2-ethyl hexanoate was added to the reaction system, which was allowed to react for subsequent 3 hours while its temperature was maintained at 100°C. After termination of the reaction, the solid content was adjusted to 30% using xylene, and a defoaming agent [DG-1] was obtained. So synthesized polymer had a weight-average molecular weight of 17,000.

Production Example 2 of a defoaming agent

A defoaming agent was prepared in the identical manner with above Production Example 1, except that the following solution (a-2) was added dropwise in place of the solution (a-1) used in Production Example 1.

Solution (a-2)

Hexadecyl methacrylate	190 parts
Lauryl vinyl ether	80 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	30 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	6 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 30% using xylene, and a defoaming agent [DG-2] was obtained. So synthesized polymer had a weight-average molecular weight of 25,000.

Production Example 3 of a defoaming agent

A defoaming agent was prepared in the identical manner with Production Example 1, except that the following solution (a-3) was added dropwise in place of the solution (a-1) used in Production Example 1.

Solution (a-3)

Lauryl methacrylate	155 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	145 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 30% with xylene, and a defoaming agent [DG-3] was obtained. So synthesized polymer had a weight-average molecular weight of 23,000.

Production Example 1 of a flow-and-leveling agent

A 1000 ml-reaction vessel equipped with a stirrer, reflux condenser, dropping funnel, thermometer and gaseous nitrogen inlet port was charged with 150 parts of toluene which was heated to 110°C and refluxed under introduction

of gaseous nitrogen. Then the following solution (b-1) was dropped into the system at a constant rate through the dropping funnel, consuming 2 hours.

Solution (b-1)

2-Ethylhexyl acrylate	285 parts
2-Isocyanatoethyl methacrylate	15 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	9 parts

An hour after completion of the dropwise addition of the solution (b-1), 3 parts of t-butylperoxy-2-ethylhexanoate was added and the system was allowed to react for subsequent 2 hours while its temperature was maintained at 110°C. After termination of the reaction, the solid content of the reaction product was adjusted to 50% with toluene, and a flow-and-leveling agent [SG-1] was obtained. So synthesized polymer had a number-average molecular weight of 10,000.

Production Example 2 of a flow-and-leveling agent

The reaction was conducted in the identical manner with above Production Example 1 of the flow-and-leveling agent, except that the following solution (b-2) was used in place of the solution (b-1).

Solution (b-2)

n-Butyl acrylate	190 parts
Isobutyl vinyl ether	80 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	30 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 50% using toluene, and a flow-and-leveling agent [SG-2] was obtained. So synthesized polymer had a number-average molecular weight of 3,500.

Production Example 3 of a flow-and-leveling agent

The reaction was conducted in the identical manner with the Production Example 1 of the flow-and-leveling agent, except that the following solution (b-3) was used in place of the solution (b-1).

Solution (b-3)

n-Butyl acrylate	95 parts
Methacryloyloxypropylpoly-dimethylsiloxane	60 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	145 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	6 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 50% using toluene, and a flow-and-leveling agent [SG-3] was obtained. So synthesized polymer had a number-average molecular weight of 9,000.

Comparative Example 1 of producing a defoaming agent

A reaction vessel similar to the one used in Production Example 1 of the defoaming agent was charged with 100 parts of xylene, which was heated to 100°C under introduction of gaseous nitrogen. Then the following solution (c-1) was added dropwise through the dropping funnel at a constant rate, consuming 90 minutes.

Solution (c-1)

Octadecyl methacrylate	300 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	5 parts

An hour after completion of the dropwise addition of the solution (c-1), 1.5 parts of t-butylperoxy-2-ethyl hexanoate was added, and the system was allowed to react for subsequent 3 hours while its temperature was maintained at 100°C. After termination of the reaction, the solid content of the reaction product was adjusted to 30% using xylene, and a defoaming agent [DN-1] was obtained. So synthesized polymer had a weight-average molecular weight of 20,000.

Comparative Example 2 of producing a defoaming agent

The reaction of preceding Comparative Example 1 was repeated except that the following solution (c-2) was used in place of the solution (c-1).

Solution (c-2)

Hexadecyl methacrylate	210 parts

Lauryl vinyl ether	90 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 30% with xylene, to provide a defoaming agent [DN-2]. So synthesized polymer had a weight-average molecular weight of 30,000.

Comparative Example 3 of producing a defoaming agent

The reaction of Example 1 of producing the defoaming agent was repeated, except that the 2-isocyanatoethyl methacrylate used in the solution (a-1) of said Example 1 was replaced by 2-hydroxylethyl methacrylate (solution (c-3)).

Solution (c-3)

Octadecyl methacrylate	285 parts
2-Hydroxylethyl methacrylate	15 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 30% with xylene, to provide a defoaming agent [DN-3]. The synthesized polymer had a weight-average molecular weight of 24,000.

Comparative Example 4 of producing a defoaming agent

The reaction of Example 1 of producing the defoaming agent was repeated, except that the following solution (c-4) was used in place of the solution (a-1) in said Example 1.

Solution (c-4)

Octadecyl methacrylate	295 parts
2-Isocyanatoethyl methacrylate	5 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

An hour after completion of the dropwise addition of the solution (a-1), 1.5 parts of the t-butylperoxy-2-ethyl hexanoate was added to the reaction system, which was allowed to react for subsequent 3 hours while its temperature was maintained at 100°C. After termination of the reaction, the solid content of the reaction product was adjusted to 30%, to provide a defoaming agent [DN-4].

The synthesized polymer had a weight-average molecular weight of 19,000.

Comparative Example 5 of producing a defoaming agent

The reaction of Example 1 of producing the defoaming agent was repeated, except that the following solution (c-5) was used in place of the solution (a-1) in said Example 1.

Solution (c-5)

Octadecyl methacrylate	140 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	160 parts
Xylene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

An hour after completion of the dropwise addition of the solution (a-1), 1.5 parts of the t-butylperoxy-2-ethyl hexanoate was added to the reaction system, which was allowed to react for subsequent 3 hours while its temperature was maintained at 100°C. After termination of the reaction, the solid content of the reaction product was adjusted to 30%, to provide a defoaming agent [DN-5]. The synthesized polymer had a weight-average molecular weight of 22,000.

Comparative Example 1 of producing a flow-and-leveling agent

A reaction vessel similar to the one used in Production Example 1 of the flow-and-leveling agent was charged with 150 parts of toluene which was subsequently heated to 110°C and refluxed under introduction of gaseous nitrogen. Then the following solution (d-1) was dropped into said system at a constant rate through the dropping funnel, consuming 2 hours.

Solution (d-1)

2-Ethylhexyl acrylate	300 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	6 parts

An hour after completion of the dropwise addition of the solution (d-1), 3 parts of t-butylperoxy-2-ethylhexanoate was added and the system was allowed to react for subsequent 2 hours while its temperature was maintained at 110°C. After termination of the reaction, the solid content of the reaction product was adjusted to 50% with toluene, and a flow-and-leveling agent [SN-1] was obtained. The synthesized polymer had a number-average molecular weight of 9,500.

Comparative Example 2 of producing a flow-and-leveling agent

The reaction was conducted in the identical manner with above Comparative Example 1 of producing the flow-and-leveling agent, except that the following solution (d-2) was used in place of the solution (d-1).

Solution (d-2)

n-Butyl acrylate	205 parts
Isobutyl vinyl ether	95 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 50% using toluene, and a flow-and-leveling agent [SN-2] was obtained. The synthesized polymer had a number-average molecular weight of 3,000.

Comparative Example 3 of producing a flow-and-leveling agent

The reaction was conducted in the identical manner with the Production Example 1 of the flow-and-leveling agent, except that the 2-isocyanatoethyl methacrylate in the solution (b-1) used in said Example was replaced by N,N-dimethylacrylamide (the following solution (d-3)).

Solution (d-3)

2-Ethylhexyl acrylate	270 parts
N,N-dimethylacrylamide	30 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	6 parts

After termination of the reaction, solid content of the reaction product was adjusted to 50% using toluene, and a flow-and-leveling agent [SN-3] was obtained. The synthesized polymer had a number-average molecular weight of 10,500.

Production Example 4 of a flow-and-leveling agent

The reaction of Production Example 2 of the flow-and-leveling agent was repeated except that the following solution (d-4) was used in place of the solution (b-2).

Solution (d-4)

n-Butyl acrylate	205 parts

Isobutyl vinyl ether	90 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	5 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 50% with toluene, to provide a flow-and-leveling agent [SN-4]. The number-average molecular weight of the synthesized polymer was 3,500.

Production Example 5 of a flow-and-leveling agent

The reaction of Production Example 2 of the flow-and-leveling agent was repeated except that the following solution (d-5) was used in place of the solution (b-2).

Solution (d-5)

n-Butyl acrylate	105 parts
Isobutyl vinyl ether	35 parts
2-(0-[1'-methylpropylideneamino]-carboxyamino)ethyl methacrylate	160 parts
Toluene	100 parts
t-Butylperoxy-2-ethyl hexanoate	15 parts

After termination of the reaction, the solid content of the reaction product was adjusted to 50% using toluene, to provide a flow-and-leveling agent [SN-5]. The synthesized polymer had a number-average molecular weight of 4,000.

[0019]

TABLE 1

Additives formed in Production Examples of the defoaming agents

	Additive	Weight-average molecular weight	Non-volatile component (%)
Production Example 1	DG-1	17000	30
Production Example 2	DG-2	25000	30
Production Example 3	DG-3	23000	30

[0020]

TABLE 2

Additives formed in Production Examples of the flow-and-leveling agents

	Additive	Number-average molecular weight	Non-volatile component (%)
Production Example 1	SG-1	10000	50
Production Example 2	SG-2	3500	50
Production Example 3	SG-3	9000	50

[0021]

TABLE 3

Additives formed in Comparative Production Examples of defoaming agents

	Additive	Weight-average molecular weight	Non-volatile component (%)
Comparative Production Example 1	DN-1	20000	30
Comparative Production Example 2	DN-2	30000	30
Comparative Production Example 3	DN-3	24000	30
Comparative Production Example 3	DN-4	19000	30
Comparative Production Example 3	DN-5	22000	30

[0022]

TABLE 4

Additives formed in Comparative Production Examples of flow-and-leveling agents

	Additive	Number-average molecular weight	Non-volatile component (%)
Comparative Production Example 1	SN-1	9500	50
Comparative Production Example 2	SN-2	3000	50
Comparative Production Example 3	SN-3	10500	50
Comparative Production Example 4	SN-4	3500	50
Comparative Production Example 5	SN-5	4000	50

[0023]

Example 1 (Anti-whitening property test of the defoaming agents as added to acid anhydride-curing type clear paint, and defoaming test in melamine resin-

cured clear paint)

Anti-whitening property of painted films was conducted with those baked finish type acrylic acid anhydride-curing type clear paints of the compositions as shown in Table 5. The same additives were also added to those melamine resin-cured clear paint compositions of Table 6 and their defoaming and anti-popping test was conducted.

[0024]

Those starting materials as shown in Table 5 were homogeneously mixed with a dissolver to form an acid anhydride-curing type clear paints. To each of the paints 1% by weight to the clear paint of one of those defoaming agents shown in Tables 1 and 3 was added and dispersed with said dissolver at 2,000 r.p.m. for 2 minutes. Thus formed paint formulation each was applied on a glass plate with a 150 μm-applicator for an anti-whitening property test, and cured by baking in a 200°C oven for 30 minutes. This painted plate was cooled off to room temperature, immersed in 80°C warm water for an hour. The water was then allowed to cool off to 25°C. The painted plate was withdrawn from the water tank, and water drops on the paint film surface were wiped off with dry non-woven fabric, followed by 24 hours' drying at room temperature. The whitening condition of the paint film was visually observed.

[0025]

The defoaming test was conducted in the following manner. Viscosity of those clear paints shown in Table 6 was adjusted with a diluting solvent to 25 seconds with Ford cup #4, and each of the paints was applied onto a tin plate with an air spray gun at increasing rates so that the dry paint film thickness should vary from 20 μm to 100 μm. The painted film was allowed to stand for 3 minutes after the application, and then baked in a 160°C oven for 20 minutes to be cured.

[0026]

The test results of the paint films were evaluated as follows. The anti-whitening property of the baked films formed on the glass plates was visually evaluated in five scales from "the best" (5) to the worst (1). The defoaming property was evaluated by measuring thickness of the dry film, in which foams appeared, on the painted surface of said tin plate with a thickness gauge.

Furthermore, the whole painted surface was visually observed, and graded in five scales from "the best" (5) showing the least number of foams to "the worst" (1) showing the greatest number of foams. The test results were as shown in Table 7.

[0027]

TABLE 5

Acid Anhydride-Curing Type Clear Paint Formulations

Starting Material	Amount (parts)	Maker company
Finedic A-207S *1) (50% solution*2)	68.4	Dainippon Ink & Chemicals, Inc.
Dodecenylsuccinic acid anhydride (50% solution*2)	31.6	Wako Pure Chemical Industries, Ltd.
DNP-30 (2,4,6-tris(dimethylaminomethyl)phenol)	1.0	Wako Pure Chemical Industries, Ltd.

*1) epoxy equivalent 490 g/eq.

*2) diluting solvent:
Solvesso #100/xylene/butyl/cellosolve/n-butanol = 4/3/2/1

[0028]

TABLE 6

Melamine Resin-Curing Type Clear Paint

Starting Material	Amount (parts)	Maker company
Beckosol EZ-3530-80	57.9	Dainippon Ink & Chemicals, Inc.
Super Beckamine L-116-70	28.4	Dainippon Ink & Chemicals, Inc.
Diluting solvent*)	proper quantity	

*) diluting solvent:
Solvesso #100/xylene/butyl/cellosolve/n-butanol = 4/3/2/1

[0029]

TABLE 7

Test Results

Additive	Added amount (%)	Anti-whitening property	Foamed film thickness (μm)	Number of foams
Blank	—	5	20	1
DG-1	1.0	5	65	3
DG-2	1.0	5	80	5
DG-3	1.0	5	50	3
DN-1	1.0	2	80	5
DN-2	1.0	1	80	5
DN-3	1.0	3	40	2
DN-4	1.0	2	70	4
DN-5	1.0	5	20	1

[0030]

Example 2 (Anti-whitening property test of the flow-and-leveling agents as added to clear powder coating)

The flow-and-leveling agents were added to the acrylic clear powder coating compositions as shown in Table 8, and the anti-whitening property of the baked films was tested.

[0031]

(Preparation of master batch)

An acrylic resin (Finedic A-253) was melted at 170°C, in which each one of those flow-and-leveling agents of Tables 2 and 4 was uniformly dispersed to the solid concentration of 10%, with a high speed dissolver. The dispersions were cooled, pulverized with a pin-mill and sieved through a 32 mesh-sieve to provide 10% acrylic resin master batch compositions.

[0032]

(Preparation of acrylic powder coating)

Acrylic powder coatings of Table 8, which contained the above master batch compositions, were dry-blended and then melt-kneaded in an extruder

maintained at 100-110°C. The kneaded masses were cooled, pulverized in a pin-mill, and sieved through a 150 mesh-sieve to provide white, clear powder coatings.

[0033]

(Application of the acrylic powder coatings and evaluation)

Each of above powder coatings was blown onto a glass plate by electrostatic powder coating method, to the cured film thickness of 100 μm, and the anti-whitening property of the films was evaluated. The powder coatings were also blown onto a thermoresistant stainless steel sheet (0.5 x 70 x 100 mm) each, by electrostatic powder coating method, to the cured film thickness of 40 μm. Those coated glass plates and stainless steel sheets were then baked at 160°C for 30 minutes. Evaluation of anti-whitening property was conducted in the same manner with Example 1, and the flow-and-leveling property of the baked films was visually evaluated. The results were as shown in Table 9.

[0034]

TABLE 8

Acrylic Clear Coating Powder

Starting Material	Amount (parts)	Maker Company
Acrylic resin : Finedic A-253	75.5	Dainippon Ink & Chemicals, Inc.
Curing agent : Dodecandioic acid	21	Wako Pure Chemical Industries, Ltd.
Flow-and-leveling agent: acrylic resin master batch	5	

[0035]

TABLE 9

Flow-and-Leveling Property Test Results of Acrylic Clear Powder Coatings

Additive	Amount (%)	Anti-whitening property	Flow-and-leveling property
Blank	—	5	1
SG-1	0.5	5	4
SG-2	0.5	5	5
SG-3	0.5	5	3
SN-1	0.5	1	4
SN-2	0.5	3	5
SN-3	0.5	1	3
SN-4	0.5	2	4
SN-5	0.5	5	1

[Document name] Abstract

[Abstract]

[Subject]

An additive for clear paints which transparency is the most important requirement is provided. The additive, when it is blended with clear paints, can impart defoaming property and flow-and-leveling property to the paints without inviting turbidity in the painted films caused by infiltration of water.

[Means for solution]

The clear paints can obtain defoaming property and flow-and-leveling property without inviting turbidity in the painted films caused by infiltration of water to the clear paints, when a little amount of copolymer comprising 2-50% by weight of a reactive monomer having isocyanate group or an isocyanate-derived group and 98-50% by weight of other monomer or polymer which is used as a defoaming agent and flow-and-leveling agent for the conventional paints is added to the clear paints.

[Selected Drawing]

None

INFORMATION ON RECORD OF APPLICANT

Indentification Number [000225854]

1. Date of Change: August 20, 1990

   [Reason for change] New Registration

   Address: 11-13, Uchikanda 1-chome, Chiyoda-ku, Tokyo

   Name: Kusumoto Chemicals, Ltd.